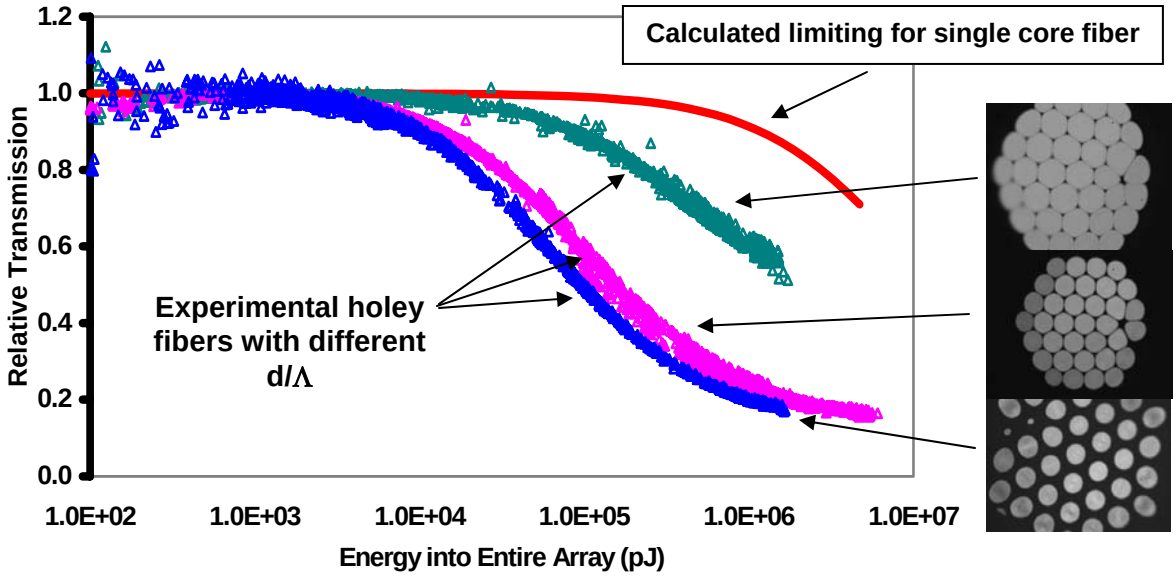
Optically Active Photonic Crystal and Holey Fibers



Enhanced Optical Limiting in an Optically Active Holey Fiber; Cores Filled with a Reverse Saturable Absorber (SiNc dissolved in dioctyl phthalate)

The exciting optical qualities of photonic crystal fibers (PCFs) are being extensively studied around the world. Their applicability to data transmission, for instance, has already been proven by NTT Access Network Service Systems Laboratories, Japan, who demonstrated high data rate transmission through 10 km of a low loss PCF. By incorporating optically active elements into photonic crystal or holey fiber matrices, a multidisciplinary team of Naval Research Laboratory researchers is developing and studying an entirely new class of materials. Their approach is to (a) model the desired optical properties; (b) fabricate the required holey fiber structure from silica or multi-component glasses; (c) incorporate optically active elements into the structure or fill selected holes with optically active polymers; (d) characterize the resulting material's optical properties; (e) compare those properties with the model; and finally (f) optimize those properties for device performance.

Experiments involve varying the number and arrangement of holes, varying the air-filling fraction, doping the fiber with photosensitive elements, and incorporating a range of new, optically active polymers. One area of advanced development is producing materials to serve as optical limiters for lasers on the battlefield or in telecommunications applications.

ADVANTAGES:

- Optical properties engineered by control of fiber structure
- Geometric control of inter-core coupling, photosensitivity, pulse dispersion, and mode volume
- Single mode behavior independent of core size
- Facilitates incorporation of various types of optically active elements in the same fiber

APPLICATIONS:

- Protection of focal plane arrays
- Night vision goggles and fiber optic twist binoculars
- Optical switches
- High thermal stability fiber Bragg grating sensors

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